

Some Opisthobranchiate Mollusca from Hawaii¹

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INTRODUCTION

IN THE ATTEMPT to advance our knowledge of the marine Mollusca of the Hawaiian Islands, groups provided with a shell have been among the first to receive attention. Largely for this reason gastropods of the order Prosobranchiata, having conspicuous shells, have become better known than have such forms as belong in the order Opisthobranchiata, in which a shell is often absent in the adult.

Such nonshelled forms present difficulty of adequate diagnosis for the establishment of taxonomic characters, inasmuch as the preserved animal soon loses its colors, partly or completely, and becomes in some way distorted because of the contraction of various anatomical parts.

Since the works of Gould (1852) and Harper Pease (1860-1872), nothing appears to have been added to our knowledge of these animals in the Hawaiian area.

The present work is but a small part of what needs to be done in this large group of mollusks, which is well represented in Hawaii. Only those forms whose generic position has already been established are dealt with here. No dissection has been attempted, and specific characters have been based on external features only. The colored figures, as well as

those in black and white, have been reproduced from the author's water-color drawings.

The holotypes of all new species are deposited in the United States National Museum, paratypes and other specimens cited are in the Bernice P. Bishop Museum, Honolulu.

Acknowledgments: For his fine aid rendered over a long period of time in securing specimens for me, I am very grateful to Dr. Charles H. Edmondson. I am thankful to Otto DeGENER for many interesting specimens. During the last 2 years, while preparing this manuscript for publication, I received from Mr. Charles Cutress of the University of Hawaii many specimens of opisthobranchiates, for which I am very appreciative. Mr. Spencer Tinker, director of the Honolulu Aquarium, has rendered me valuable services by retaining for me many fine specimens of nudibranchs. For the aid in taxonomic problems so generously given me by Dr. Frank M. MacFarland, I feel a sincere appreciation. Finally, I must express my deep gratitude for the aid rendered and interest shown in this undertaking by Dr. Robert W. Hiatt, director of the Hawaii Marine Laboratory.

KEY TO INCLUDED GENERA OF HAWAIIAN OPISTHOBANCHIATA

1. Respiratory organs, when present, concealed under mantle or attached to right side of body or consisting of respiratory

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- folds; shell present or absent in the adult (suborders Tectibranchiata and Ascoglossa)2
 Respiratory organs consisting of a circle of gills surrounding the anal papilla, or of branchial processes covering the body; shell and mantle absent in the adult (suborder Nudibranchiata).....10
 2(1). Shell more or less conspicuous and generally covering mantle and gills...3
 Shell absent in adult; respiratory folds, when present, not in the form of gills..9
 3(2). Gills on dorsal side of body, usually covered by shell or mantle.....4
 Gill consisting of a plume on right side of body.....Pleurobranchus
 4(3). Shell large and almost capable of concealing the animal.5
 Shell rudimentary and nearly or entirely concealed from view.....7
 5(4). Parapodial lobes extending the whole length of animal.....Hydatina
 Parapodial lobes covering anterior part of shell.....6
 6(5). Shield extending from foot to cover posterior part of shell.....Haminoea
 No shield covering posterior part of foot.....Atya
 7(4). Shell and mantle covering gills between parapodial lobes.....8
 Shell and mantle rudimentary or absent.....Notarchus
 8(7). Shell hatchet-shaped; body of animal tapering anteriorly and obliquely truncate posteriorly.....Dolabella
 Shell somewhat oval in outline; body of animal slender and fusiform....Tethys
 9(2). Parapodial lobes united dorsally by regular margins; their inner surfaces covered with longitudinal narrow branchial folds supporting commensal algae.....Placobranchus
 Parapodial lobes with folded margins not fully united dorsally; no branchial folds present.....Elysia
 10(1). Respiratory organs consisting of a circle of gills surrounding anal papilla.11
 Respiratory organs consisting of branchial processes covering the body...13
 11(10). Cloak of great lateral spread and produced into swimming lobes folded on the sides when the animal is at rest.....Hexabranchus
 Cloak narrow and not used as swimming lobes, nor folded when the animal is at rest.....12
 12(11). Body slender, bluish white with interrupted blue striae. Gills simple pinnae, white, with bands of orange.....Glossodoris
 Body elongate, about one third as wide as long, bluish black with fine white specks. Gills with long lateral branches.....Doridopsis
 13(10). Body broad anteriorly, tapering posteriorly and covered with numerous slender branchial papillae. Rhinophores and oral tentacles simple.....Aeolidia
 Body slender, fusiform, beset with two rows of broad branchial processes. Rhinophores placed on dorsal side of an extensive oral veil.....Melibe

CLASSIFICATION OF SPECIES CONSIDERED

- Suborder Tectibranchiata
 Family Scaphandridae
 Genus *Atya*
 (*A. semistriata*)
 Family Akeridae
 Genus *Haminoea*
 (*H. crocata*)

Family Hydatinidae

Genus *Hydatina*(*H. physis*)

Family Aplysiidae

Genus *Tethys*(*T. elongata*)Genus *Notarchus*(*N. lineolatus*)Genus *Dolabella*(*D. variegata*)

Family Pleurobranchidae

Genus *Pleurobranchus*(*P. delicatus*)

Suborder Ascoglossa

Family Placobranchidae

Genus *Placobranchus*(*P. ianthobapsus*)

Family Elysiidae

Genus *Elysia*(*E. elsieae*, *E. degeneri*, *E. nealae*)

Suborder Nudibranchiata

Tribe Holohepatica

Family Dorididae

Genus *Glossodoris*(*G. prismatica lineata*)Genus *Doridopsis*(*D. macfarlandi*)

Family Hexabranchidae

Genus *Hexabranchus*(*H. tinkeri*, *H. aureomarginatus*)

Tribe Cladohepatica

Family Aeolidiidae

Genus *Aeolidia*(*A. edmondsoni*)

Family Fimbriidae

Genus *Melibe*(*M. pilosa*)*Atys semistriata* Pease

Fig. 1

Atys semistriata Pease, Zool. Soc. London, Proc. 1860: 20.*Atys semistriata* Pease. Tryon and Pilsbry, Man. Conch. 15: 267, pl. 28, fig. 30, 1893.A living specimen of *Atys semistriata* was

obtained off the Hawaii Marine Laboratory at Waikiki in August, 1921. During its captivity this specimen deposited an egg mass, which has been described and figured, including the veliger larval stage (Ostergaard, 1950: 105).

When the animal is active and fully extended, it is 13 millimeters in length. Head shield broad, truncate anteriorly, bilobed posteriorly, lobes small and rounded. Epipodial lobes extending over anterior half or body, meeting middorsally to cover anterior part of shell. Foot bilobed; anterior portion truncate and larger than posterior portion, which tapers to a broadly rounded extremity. Color pale bluish white and peppered with minute black specks. Mantle, visible within the semitransparent shell, also pale bluish white with crowded masses of well-defined longitudinally elongate carmine spots. Eyes conspicuous, located between lobes of head shield.

The description of the shell by Pease is as follows:

"Shell oval contracted posteriorly, thin, fragile, pellucid, white, transverse raised lines at both ends; aperture slightly dilated at the base; apex perforate."

Haminoea crocata Pease

Fig. 2

Haminoea crocata Pease, Zool. Soc. London, Proc. 1860: 19.*Haminoea crocata* Pease. Tryon and Pilsbry, Man. Conch. 15: 363, 364, pl. 40, fig. 3, 1893.

From a group of seven specimens of living animals collected during March, 1923, at Wai-anae, Oahu, a description of the external parts of this vividly colored animal is as follows:

Animal somewhat fusiform, truncate anteriorly and bluntly pointed posteriorly. Cephalic disc large, truncated anteriorly, bilobed posteriorly, lobes long with rounded extremities. Eyes minute, located anterolaterad of anterior division of cephalic lobes. Epipodial

lobes large, reflexed over, and partly covering, the shell. A posterior shield extending dorsally to cover posterior part of shell. Foot divided into a larger anterior and a smaller posterior portion. Anterior portion truncate at both ends; posterior portion truncate anteriorly and bluntly rounded posteriorly. Both portions of foot continuous with epipodial lobes and posterior shield, respectively. All external parts of animal pale blue with faint purple blotches and with numerous bright orange spots of various sizes scattered quite evenly over all. Mantle visible through semi-transparent shell, dark green with large orange

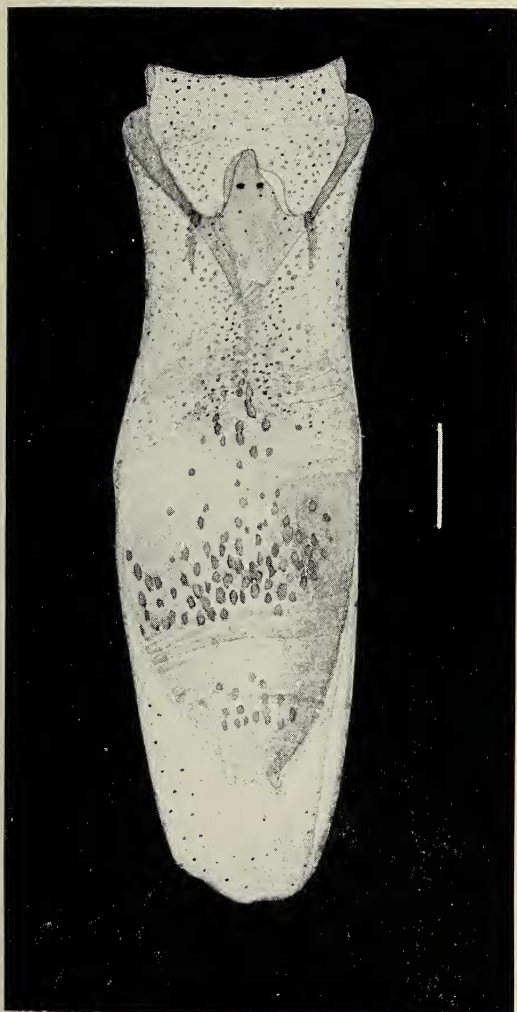


FIG. 1. *Atys semistriata* Pease, dorsal aspect ($\times 8$).

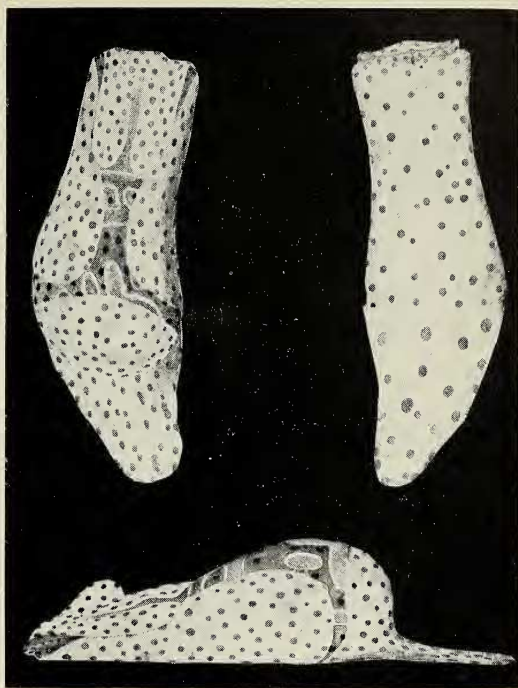


FIG. 2. *Haminoea crocata* Pease, dorsal, ventral, and lateral aspects ($\times 2$).

hieroglyphs and small round dark-red spots.

Length of animal, when creeping and fully extended, is 3 centimeters.

Tryon and Pilsbry (1893: 363–364) give the following description of the shell:

Shell ovate-elongate, moderately solid, yellow, becoming orange on the latter part of the last whorl, and opaque above and below. Surface shining, showing slight, irregular growth-wrinkles and excessively fine, close, superficial spiral crenulated striae. Vertex narrow, very slightly impressed, imperforate or nearly so, opaque white in the center; lip inserted on the right of the center of the vertex, thickened; outer lip well curved; columella moderately concave, with a reflexed white callus, not folded above.

Alt. 13, diam. $8\frac{1}{2}$ mm. Sandwich Is.

A description and figures of the egg structure of this mollusk are given in Ostergaard (1950).

Hydatina physis (Linnaeus)

Fig. 3

Bulla physis Linn., Syst. Nat., p. 727, 1758.

Hydatina physis Linn. Tryon and Pilsbry, Man.

Conch. 15: 387, 388, pl. 45, figs. 14–17, 1893.

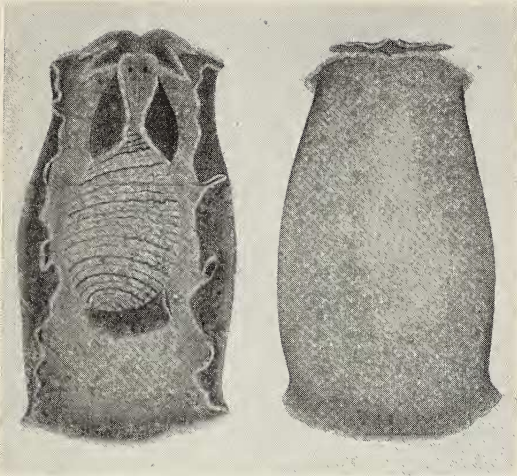


FIG. 3. *Hydatina pysis* (Linnaeus), dorsal and ventral aspects (ca. $\times 1.3$).

Animal large and when active about three times as long as its shell. Head disc with four lobes of about equal size bluntly pointed at their tips. Two large, ear-like lobes extending posteriorly from head disc, partly covering anterior part of shell. Foot very broad and continuous with dorsally directed parapodial lobes; truncate at both ends, widest posteriorly. Parapodial lobes much folded along margins, which are partly flexed over shell. Foot, both dorsally and ventrally, bluish purple, merging into a vivid brown toward margins. Head disc, anterior lobes, and mantle vivid brown, edged like anterior and posterior margins of foot with bluish or greenish white. Eyes conspicuously placed posterior to head disc. Gill pale bluish purple, turned inward at tip, and about 5 mm. in length, with 18 or 20 plumules. Length of animal about 4 cm.; length of shell 16 mm.

The specimen here described and figured was obtained during the latter part of June, 1922, at Kawailoa, Oahu, where it was found among a number of *Hydatina amplustre*. Other specimens have been found off the Hawaii Marine Laboratory at Waikiki.

The characters of the shell correspond well with those of the typical form figured and described by Tryon and Pilsbry (1893: 387, pl. 45). The description is as follows:

Shell large, globose or oval, thin; under a thin buff cuticle the shell is white, with many close wavy brown spiral lines. Surface very slightly and coarsely waved longitudinally, otherwise smooth. Vertex flat, the spire about level; whorls about $3\frac{1}{2}$, the first a minute globose, uptilted and half immersed nucleus, the rest separated by deep sutures. Body-whorl globose above, somewhat attenuated below, where there is a convex spiral rib surrounding the umbilical tract; aperture about as long as the shell, large, ovate, narrower and curved above, dilated below. Lip simple and thin, very little retracted toward its upper insertion, rounded at base, bluntly angled at foot of the columella. Columella gently concave or nearly straight, with reflexed edge, leaving an umbilical chink or rarely none.

Spawn and the veliger stage of the larva are described and figured in Ostergaard (1950).

Tethys elongata (Pease)

Fig. 4

Siphonata elongata Pease, Zool. Soc. London, Proc. 1860: 24.

Tethys elongata Pease. Tryon and Pilsbry, Man. Conch. 16: 93, pl. 59, figs. 35–38, 1895–96.

Because of the rather strikingly different coloration of some of my specimens of this animal, they might appear to be different from the specimens of *T. elongata* (Pease), which is common on seaweeds along the leeward shores of Oahu; but after a study of them and a comparison with typical forms, I concluded that they constituted a color variation, merely, as no different characters could be discerned either in their external anatomy or shell.

I enter herewith a description of this color form:

Body elongate fusiform, slender, terminating posteriorly in an obtuse point. Rhinophores erect with acutely pointed extremities, and widely slit throughout the distal half of their length. Anterior, or labial, tentacles involute, broad and flaring in their proximal half. Foot rounded anteriorly and obtusely pointed posteriorly. Parapodial lobes high, ample, and folded, occupying the middle third of the body. To the left of the mantle, from which the wide, flaring siphon extends, can be seen a portion of the shell. Genital

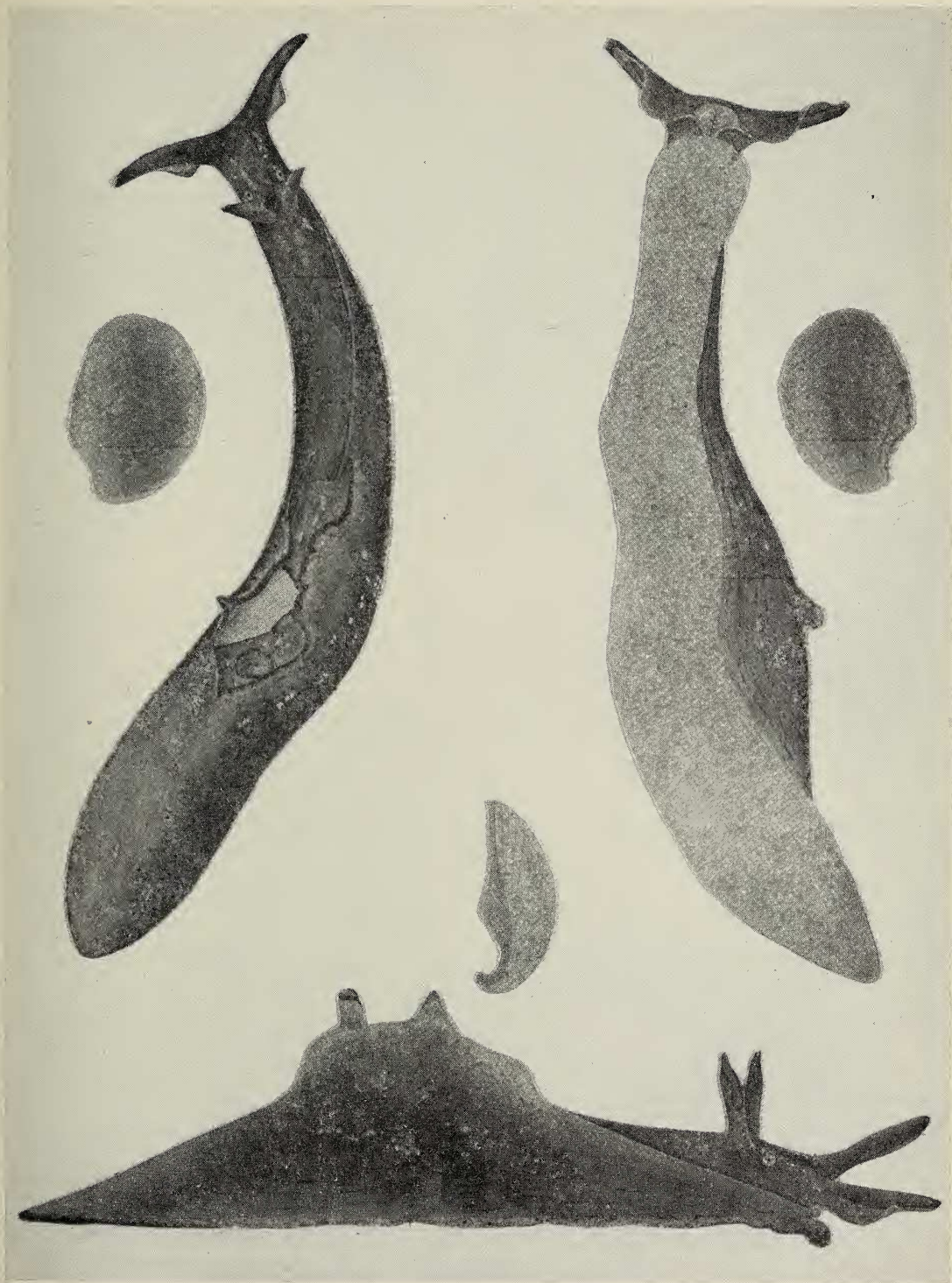


FIG. 4. *Tethys elongata* (Pease), dorsal, ventral, and lateral aspects of animal ($\times 4.3$) and shell.

groove conspicuous, extending from genital pore, between anterior margins of parapodial lobes, anterolaterad to base of right labial tentacle, where penis is located. Eyes, anterolaterad of rhinophores, conspicuous for their broad white rings. Body and head dark purplish brown with sprinkles of groups of fine white specks, particularly in region of parapodial lobes. Sole of foot cream yellow. When disturbed, the animal emits a purplish carmine fluid. Length of body 31 millimeters.

Shell large, yellowish olive green, 8 millimeters in length, deeply concave with prominent beak. Radial lines and growth lines distinct.

Seven specimens of this color form were found near the Hawaii Marine Laboratory, Waikiki, during May, 1923, where some of the typically colored forms also occurred. It will be noted in the specimen described and figured that the parapodial lobes are edged with black, and that rhinophores and labial tentacles are tipped with the same color. In some of the specimens this color was reversed, these areas being white instead of black.

Description and figures of egg filament, cleavage, and veliger stage are given in Ostergaard (1950: 100).

Notarchus lineolatus (Gould)

Fig. 5

Stylocbeilus lineolatus Gould, U. S. Expl. Exped., Moll., p. 225, pl. 16, figs. 270, 270a, 1852.

Notarchus lineolatus Gould. Tryon and Pilsbry, Man. Conch. 16: 140, pl. 29, figs. 37-39, 1895-96.

Body from 2.5 to 4 centimeters in length, elongate, fusiform, tapering to acute point posteriorly. Parapodial lobes swollen and rounded, broadly united behind, almost meeting in front. Gills large and arched, convex posteriorly, concave anteriorly, bluish with fine brown veins and white specks; mantle very rudimentary, not covering the gills. Anal papilla long, slender. Anterior tentacles loosely involuted; from them a pair of small obtuse

lobes extending posterolaterad of buccal disc. Rhinophores long, cylindrical, tapering slightly toward their extremities, slit in the distal half. Integument of rhinophores and anterior tentacles raised into small white or yellowish conical cirri. Similar, but larger, cirri occur throughout body region; largest at margins of parapodial lobes where some of them are branched. Foot slightly narrower than body, truncate anteriorly and tapering posteriorly to acute point. Foot pale bluish green, darker where viscera show through, marked throughout with numerous interrupted light brown striae, and in some specimens, especially in young individuals, sprinkled with minute white specks. Head, body, and dorsal surface of foot marked with fine, longitudinal, closely crowded, wavy, dark-brown lines, and with irregularly scattered ocelli whose pupils are blue with a dark brown ring and a light brown outer zone.

In quite young animals the ocelli are wanting, the dorsal striae are few and comparatively heavy, and the cirri are all unbranched. In specimens of 5.5 millimeters length, cirri may not be present. In intermediate stages of growth, the observed transition between young and adult seems to indicate that changes of color and structure take place gradually.

When disturbed, the animal emits a clear bluish-purple fluid.

The following is Gould's description of *Notarchus lineolatus*:

Animal elongated, delicately attenuated posteriorly, of a pale grass-green color, ornamented with longitudinal, parallel, contorted, rusty lines, and scattered ocelli of unequal size. The papillae of the mantle [he evidently mistook the parapodial lobes for the mantle] are branching. The anterior tentacles are short, tapering, and destitute of papillae.

Length three and a half inches.

Found on a coral reef at Honolulu, Oahu.

The animals were found at Kawaihoa, Oahu, during June, 1922, where they occurred in large numbers on seaweeds, upon which they appear to feed. A rather pale variety has been found at Waikiki. From Nanakuli, Oahu, 15 specimens were obtained in March, 1921.

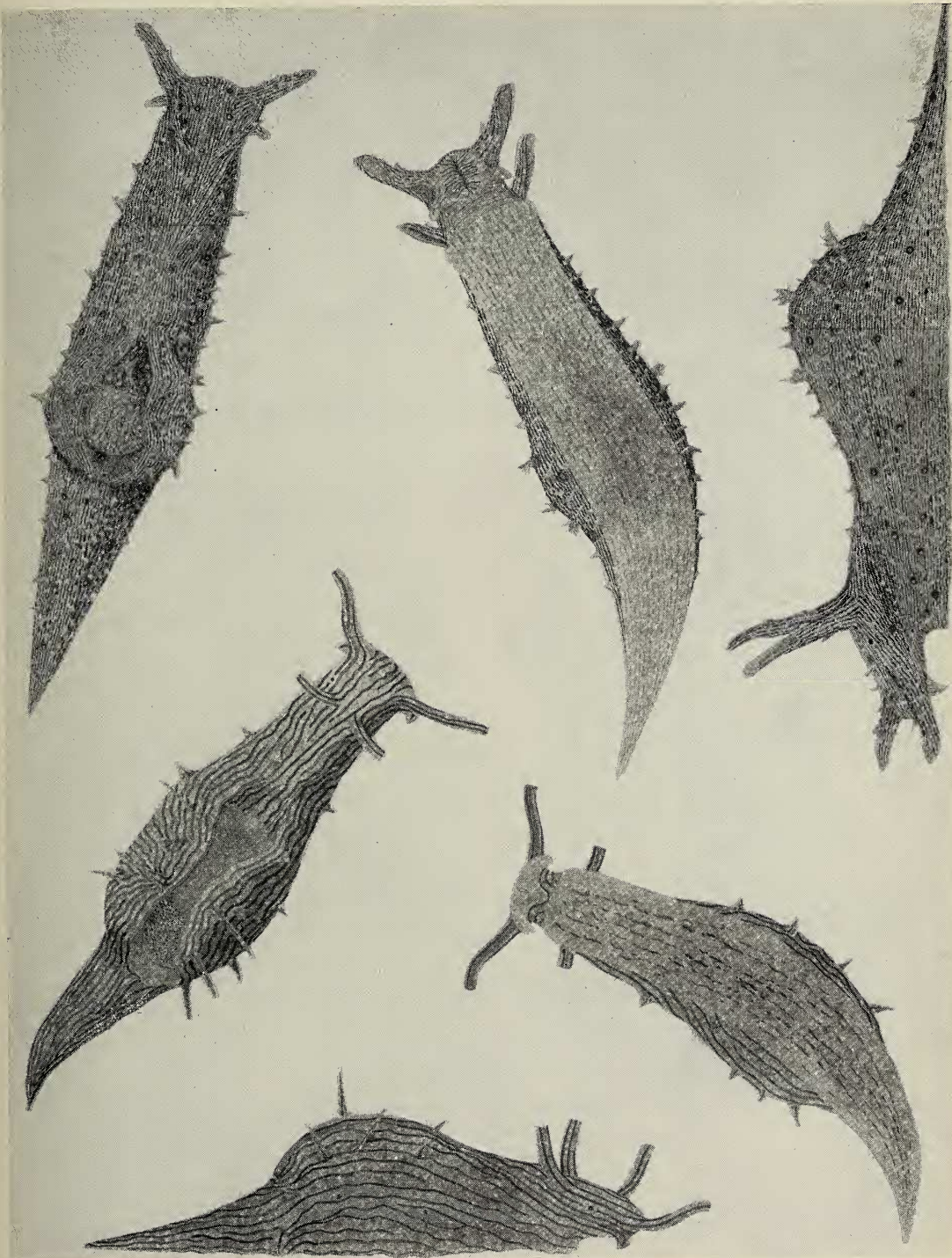


FIG. 5. *Notarchus lineolatus* (Gould), dorsal, ventral, and lateral aspects. Upper, mature; lower, juvenile (ca. $\times 3$)

These ranged in length from 12 to 57 millimeters. The figured example is 32 millimeters in length.

These mollusks are very prolific egg layers during June and July, at which time they festoon their pale-green thread-like filaments on every object with which they come in contact.

A description of the spawn, development, and veliger stage of this species is given in Ostergaard (1950: 101-102). In that publication the species has been erroneously named *Notarchus striatus* Quoy and Gaimard, which it resembles quite closely.

Dolabella variegata Pease

Fig. 6

Dolabella variegata Pease, Zool. Soc. London, Proc. 1860: 22.

Dolabella variegata Pease. Tryon and Pilsbry, Man. Conch., 16: 155, 156, pl. 28, figs. 33-36, 1895-96.

Animal oblong, conical, tapering anteriorly, obliquely truncate posteriorly. Head and body covered with small acute tubercles, which are scabrous and furnished with pale, soft cirri. Parapodial lobes closely appressed, the left tending to overlap the right, leaving two dorsal openings—one a little anterior to point of truncation, other at center of body. Rhinophores stout, involute, and open laterally. Oral tentacles short, stout, dilated distally and open laterally. Eyes located antero-laterad to rhinophores. Foot truncate anteriorly and obtusely rounded posteriorly, widest one-fourth distance from posterior end. Greenish olive, variegated with brown, white, and green. Foot greenish brown, clouded with olive green, evenly sprinkled with fine, round, pale-brown spots.

Dorsal aspect in Figure 6 of a specimen 17 centimeters long with a transverse diameter, at its widest part, of 8 centimeters, other illustrations taken from smaller specimens.

Specimens with a green coloration predominating have been found at Waikiki.

Shell hatchet-shaped, strongly curved with one nuclear convolution from which a fold extends around the apex. Proximal margin broad; growth lines numerous, fine. Color yellowish white and pink toward apex. Length 30 millimeters, width of proximal border 21 millimeters.

Pleurobranchus delicatus (Pease)

Fig. 7

Pleurobranchus delicatus Pease, Zool. Soc. London, Proc. 1861: 245.

Pleurobranchus delicatus Pease. Tryon and Pilsbry, Man. Conch., 16: 202, pl. 45, figs. 7-9, 1895-96.

Animal delicate, subpellucid, cloak smooth, oblong oval, rounded at both extremities, transversely convex. Foot, elongate oval, may or may not extend beyond cloak. Rhinophores rather short, involute, with truncate extremities. Oral veil triangular with anterior border straight and of greatest width, narrowing gradually toward head. Eyes placed on dorsolateral side of head and near base of rhinophores. Branchial plume on right side of body, nearly half as long as animal, bipinnate, with about 28 pairs of pinnules; pink. Genital apertures distinctly separate, near anterior end of body on right side. Length of body 44 millimeters, width 22 millimeters.

The shell is small and corresponds well with the description given by Pease, which I quote here:

Shell small, rather solid, subpyriform, elongate, narrow posteriorly, rounded in front, slightly flexuous; surface rough and marked with prominent lines of growth; nucleus spiral, anterior portion stained with violet, posteriorly white or light horn color.

The color of the cloak is bright orange; that of the foot, rhinophores, and oral veil is pale pink bordered with orange. The dark-colored viscera may be seen through both foot and cloak.

Four specimens were found off the Hawaii Marine Laboratory at Waikiki in October, 1922. An additional four specimens were

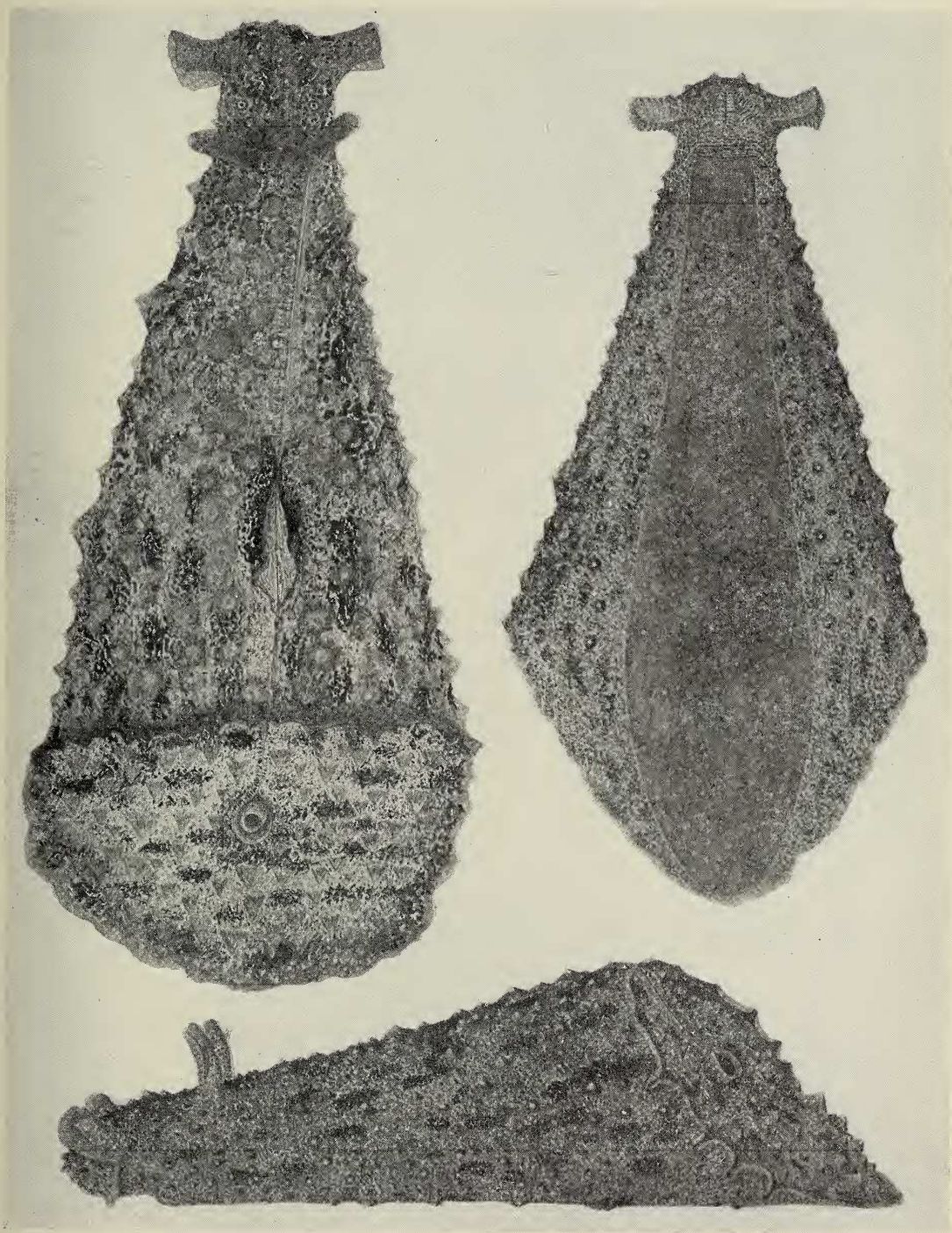


FIG. 6. *Dolabella variegata* (Pease), dorsal, ventral, and lateral aspects ($\times 0.8$).

Placobranchus ianthobapsus Gould

Fig. 8

Placobranchus ianthobapsus Gould, U. S. Expl. Exped. 12: 307, pl. 26, figs. 407a-c, 1852.

Body elongate, dorsoventrally compressed, tapered slightly toward truncate posterior extremity. Oral hood broad, lateral continuations of which form the tentacles. Mouth situated ventrally, within cavity formed by hood. Tentacles involute, retractile apically, tapering distally, directed laterad at base and distal ends usually turned slightly upward and forward, much like the horns of an ox. They are whitish yellow to vivid greenish yellow, with tips of pale reddish purple that tends to form a band of a deeper tinge. Dorsal surface light yellowish green to pale green, in some specimens clouded with olive green or olive brown. Ocelli crowding surface of head and body, of three types: (1) small, numerous bodies with yellow or brownish-orange pupil surrounded by a white iris; (2) a larger and less numerous type with yellowish or olive-green pupil with light-green center and white iris surrounding pupil; (3) the largest type and least numerous, with greenish or sky-blue pupil surrounded by a thick black ring and usually without the white iris. These ocelli are usually promiscuously scattered and intergrade with one another; but in some individuals they tend to become arranged bilaterally on the dorsal surface, especially the large black-ringed type, which are always numerous along the lateral margin of the foot. Eyes small, retractile, placed in shallow orbits on lateral sides of an anteriorly pointing prominence on the middorsal side of head. Branchial surface pale green with numerous longitudinal folds crowded with grass-green algae. Cardiac swelling triangular, white and prominent, placed directly posterior to the head. Margins of the body, meeting mid-dorsally, thick, pellucid, whitish blue with a series of opaque yellowish-green oval or ob-long bodies. Foot bluish green with numerous ocelli of unequal sizes with pupils from olive

FIG. 7. *Pleurobranchus delicatus* (Pease), dorsal, ventral, and lateral aspects (natural size); branchial plume (enlarged).

found on windward Oahu, near Makapuu, June 30, 1950.

The specimen I have figured (the first one obtained) has a much smaller cloak than others (obtained later) which agree with Pease's description. It is possible that the cloak might have been injured and was in process of regeneration.

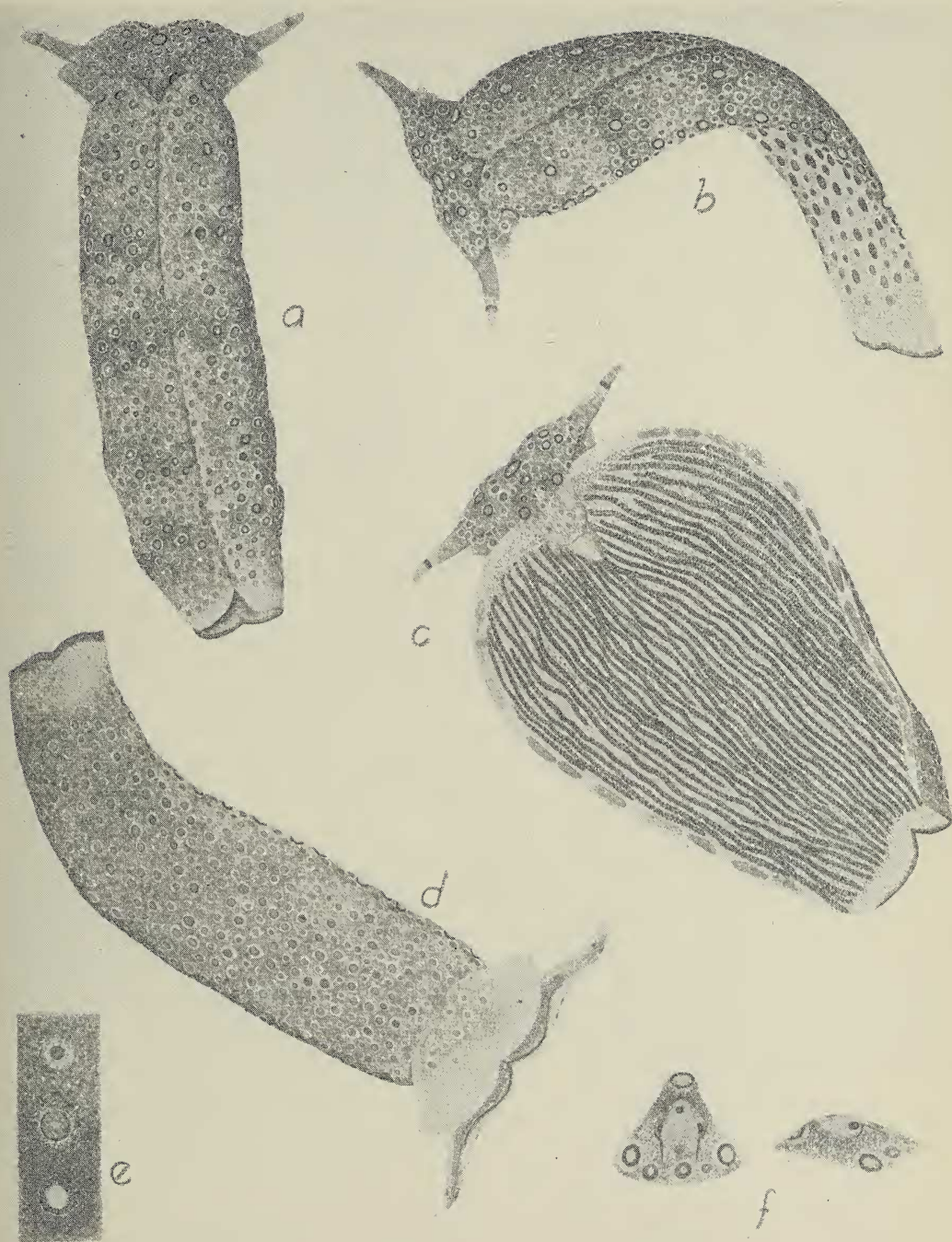


FIG. 8. *Placobranchus ianthobapsus* Gould. *a*, Dorsal aspect; *b*, creeping individual; *c*, expanded to show branchial surface with rows of symbiotic algae; *d*, ventral aspect; *e*, three principal types of ocelli; *f*, details of dorsum of head showing eyes. (*a*, *b*, *c*, *d*, ca. $\times 8.6$; *e*, *f*, greatly enlarged.)

green to dark brown surrounded by a white iris. Posterior end of foot and anterior margin of oral hood bordered with purple. Anteriorly, foot partly divided into a triangular, laterally extending lobe with a few ocelli on posterior portion of its ventral surface; ocelli on dorsal side resembling those of second type. Posterior region of foot unmarked and merging into a very pale bluish green, extending to its purple border. Length of animal 5 centimeters.

The following is Gould's description:

Body elongated, in the form of a three-sided prism, terminating abruptly, as if torn off behind. Head broad, heart-shaped in front, lip edged with violet; tentacles involute, as if formed by an extension of the angles of the hood; ochreous tipped with white, annulate with violet near the lip [*tip* must have been intended for the word *lip*], retractile at tip. Colour of the back yellowish, shaded with olive, ornamented with two sets of ocelli, the larger in two series of eight on each side, with a blue pupil and white iris, and numerous smaller ones with orange pupil and white iris; foot not distinct from the body except in colour, emerald green, with the blue and orange ocelli smaller, and more nearly equal in size than those of the back. Margins of the body dilated and folded upon the back; branchial folds grass-green, radiating from the cardiac swelling behind the head.

Length two and a half inches; breadth five-eighths of an inch.

Found upon a coral reef at Honolulu, Sandwich Islands.

A study of his figures, alone, would lead me to conclude that Gould's species is different from mine; but, from the reading of his description, which clears up defects in the figures, I am led to believe that they are identical.

HABITAT: On mud flats at Coconut Island, Kaneohe Bay, Oahu, where many specimens have been obtained from time to time. Specimens have been obtained from Kahala, others from the Island of Molokai, the latter being but half the size of those found in Kaneohe Bay.

All specimens obtained agree closely in structure and coloration, and they seem to show no seasonal fluctuation in their occurrence.

The spawn and larval stage is described and figured in Ostergaard (1950: 107-108).

Elysia elsieae sp. nov.

Fig. 9, Pl. 1

Body slender, elongate, tapering posteriorly to an acute point. Parapodial lobes thick and wavy. Rhinophores long and of equal diameters, curved anterolaterad with extremities directed laterally. Eyes very prominent, placed posterior to lateral base of rhinophores. Foot truncate anteriorly and tapering to acute point posteriorly. Head shield continuous laterally with rhinophores. Penis on right side about one-fourth distance from anterior end. Mouth, somewhat indistinct, located on head shield near its ventral margin. Color of body and foot pale bluish green; foot flecked with white. Body and both surfaces of parapodial lobes crowded with white and with black round spots of various sizes. Margins of parapodial lobes edged with pale pinkish carmine bordered with golden yellow and dark-green lines. Rhinophores pink with an irregular band of carmine near base and with purple extremities; within, pink color is heavily peppered with minute black specks. Similar peppering found on head shield. Heart, as prominent swelling, appearing between anterior ends of parapodial lobes.

Length of animal 15 millimeters, width 2.5 millimeters.

Holotype (U.S.N.M. 574928), May 1924, off Hawaii Marine Laboratory, Waikiki.

The figures are made from what appears to be an immature specimen, obtained in June, 1922, off the Hawaii Marine Laboratory, Waikiki, and which was about half the length of the many other specimens gathered later from the same locality, where they were abundant during the summer of 1924 in shallow water close to shore, on algae or on the sand.

I have named this beautiful little species for my daughter Elsie for the interest and enthusiasm she showed in my pursuit of its study.

In some specimens, the larger black spots appear as thick rings with small white pupils. In others, the white spots on the lateral sides



FIG. 9. *Elysia elsieae* n. sp., dorsal and ventral aspects with mantle closed and (lower) dorsal aspect with mantle expanded ($\times 19$).

of the parapodial lobes were elevated into conical papillae. The animals would often float at the surface of the water in an inverted position.

The egg filament and development of the larvae are described and figured as *Elysia* sp. in Ostergaard (1950: 108).

The species admits of comparison with *Elysia lobata* Gould (1852: 308, pl. 26, figs. 405, 405a).

Gould's description is as follows:

Corpus limaciforme, gracile, dilatatum, trilobatum, virescens nigro-punctatum; palium utrinque flavo-marginatum; tentaculae elongatae.

Animal slug-like, greenish, dotted with black and bordered with yellow; edge of the mantle expanded into a three-lobed lateral wing. Head small with very large and long tentacles, tipped with sky-blue; eyes situated laterally, a little behind the tentacles. In creeping it flaps downwards, at pretty regular intervals, its long, ear-like tentacles. There are no apparent branchial organs, not even the plaits along the back, as in *Placobranchus*, to which it is otherwise evidently allied; the parts about the mouth seem to have been imperfectly figured.

Length one inch.

Found creeping on coral stems, like a small *Doris*, at Honolulu. Dr. Pickering.

Both Gould's description and figures of this species are inadequate, and it is therefore not possible to determine whether his species is identical to this.

Elysia degeneri sp. nov.

Fig. 10, Pl. 1

Body elongate, rather slender, tapering posteriorly. Parapodial lobes thrown into about four folds. Rhinophores short, stout, cylindrical, directed anterolaterad and slightly curved from base outwardly; beset with low, sharply pointed conical processes. Eyes located at posterolateral base of rhinophores, each surrounded by a white area encircled by a pale brown ring. Foot rounded anteriorly and tapered to blunt point posteriorly; capable of forming broad anterior lobe. Head shield rounded and slightly notched medially. Mouth situated on mid-ventral margin of head shield. Body, head, and foot yellowish

white with numerous minute green bodies, apparently commensal algae; yellowish-white ground color of body merging with pale brown of parapodial lobes and of head, which have a reticulum of a darker brown. Margins of parapodial lobes ornamented with small, elongate brown bodies regularly spaced. Inner surface of parapodial lobes next to margin with narrow area of deep orange; beyond this

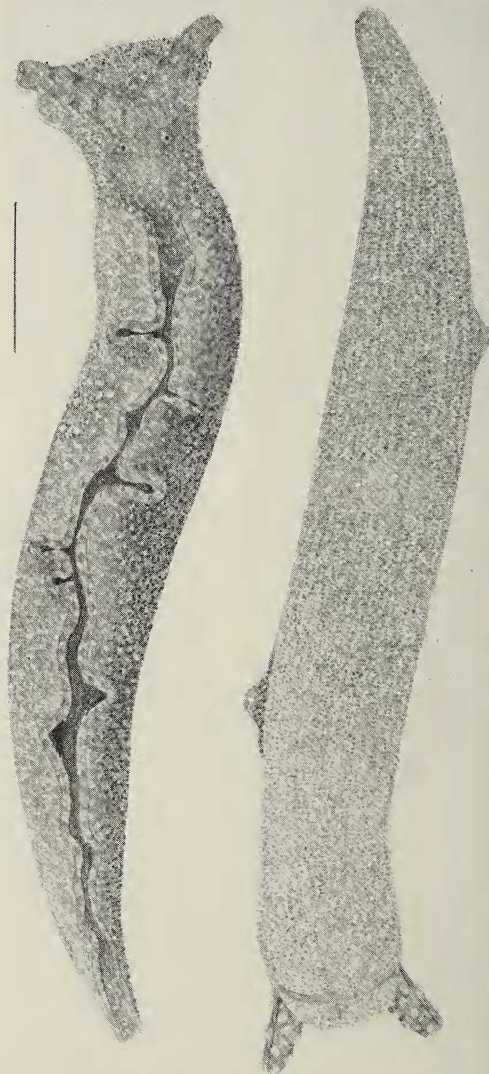
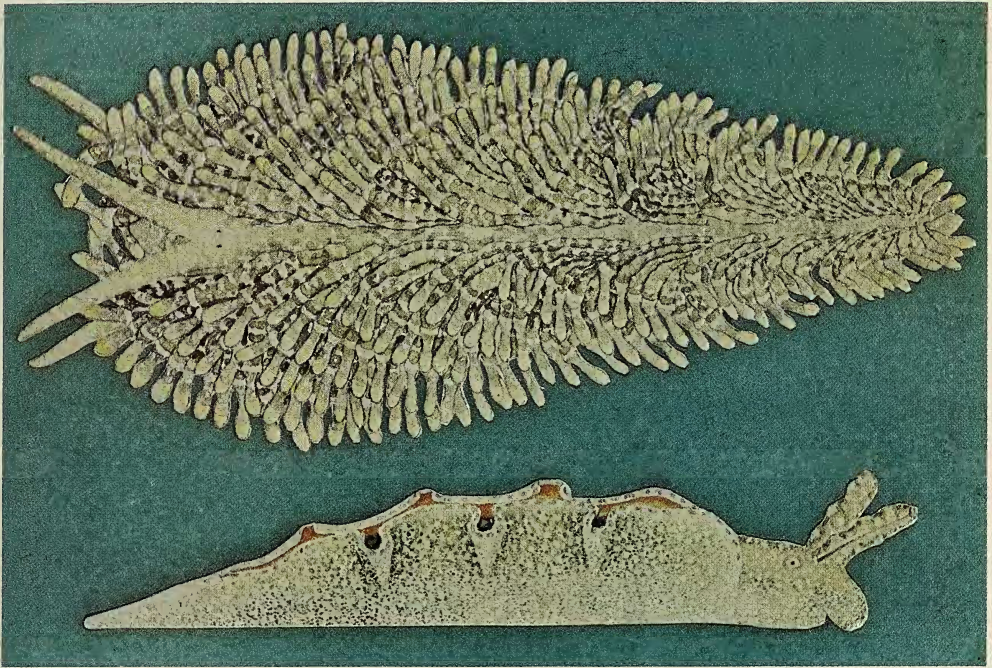
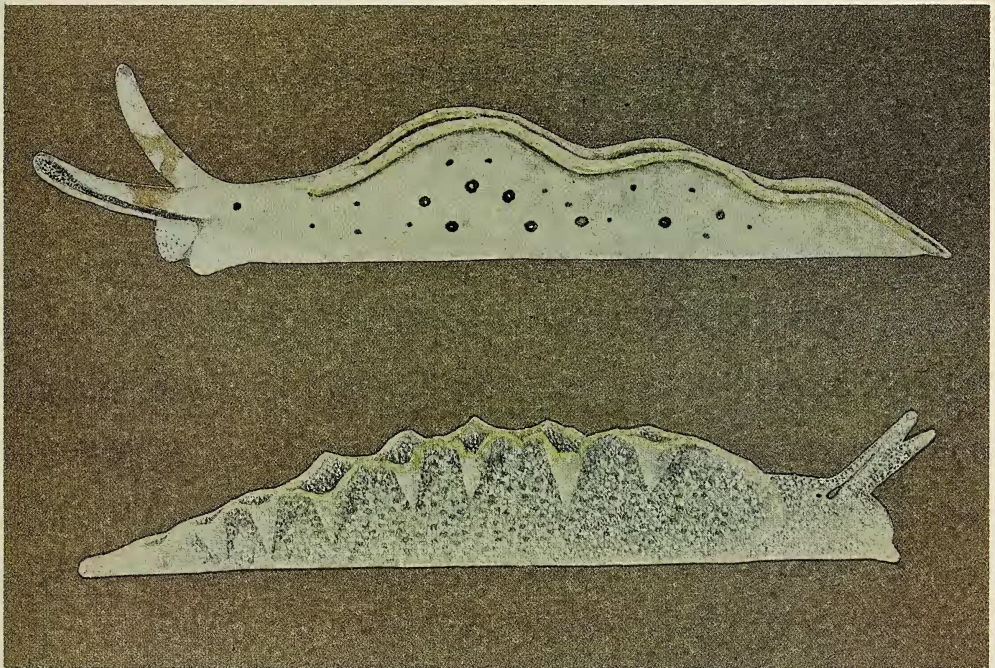


FIG. 10. *Elysia degeneri* n. sp., dorsal and ventral aspects (ca. $\times 7$).

Plate I



Aeolidia edmondsoni n. sp. (upper), *Elysia degeneri* n. sp. (lower).

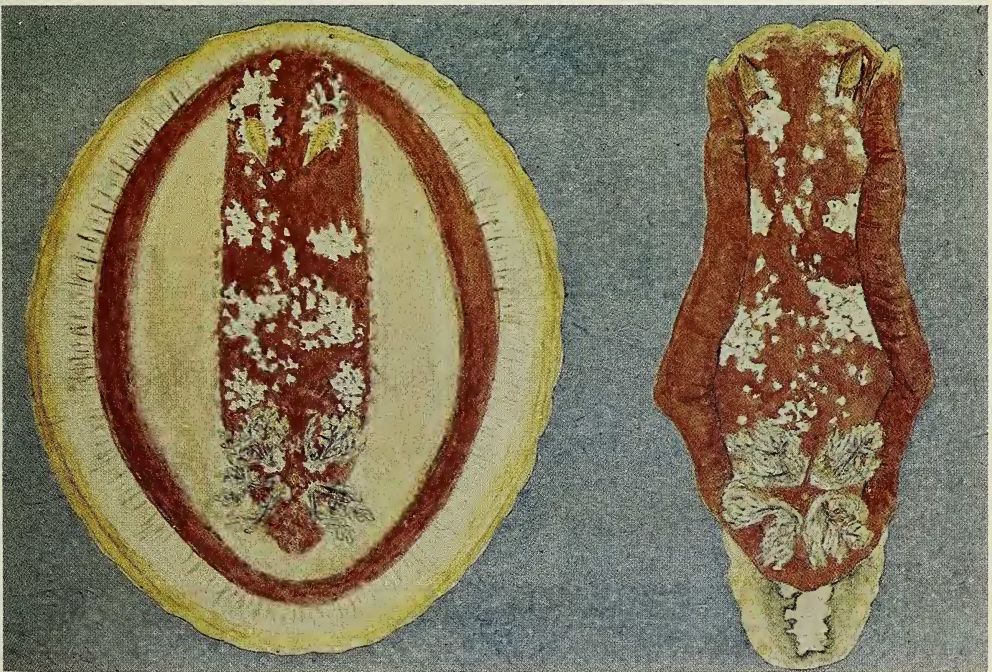


Elysia elsieae n. sp. (upper), *E. nealae* n. sp. (lower).

Plate II



Hexabranchnus tinkeri n. sp.



Hexabranchnus aureomarginatus n. sp., with mantle spread and closed.

dark green merging into pale green medially.

Length of animal 19 millimeters, width 3 millimeters.

One specimen of this vividly colored little species, designated as the holotype (U.S.N.M. 574929), was found at Waianae, Oahu, March 26, 1923, by Otto Degener, for whom I name the species. Another specimen, 25 millimeters in length, was found at Hanauma Bay, September 12, 1950, by Charles Cutress. This agrees with the type in external characters and coloration, but no algae, which give to the type its distinctive green color, were present. This commensal state may be subject to fluctuation.

Elysia nealae sp. nov.

Fig. 11, Pl. 1

Body slender, elongate, tapering posteriorly. Parapodial lobes intensely folded, medially directed folds meeting dorsally. Rhinophores slender, straight, tapering toward extremities and directed anterolaterad. Eyes prominent, placed at posterolateral bases of rhinophores, each surrounded by a small white area. Foot slightly bilobed with a shallow median notch anteriorly, and tapered to an obtuse point posteriorly. Mouth located at median margin of head shield. Pale green throughout with small white specks and fine concentrated masses of green algae, particularly conspicuous on parapodial lobes. Margin of parapodial lobes and posterior tip of body greenish yellow.

Length of animal 33 millimeters, width 4 millimeters.

One specimen, designated the holotype (U.S.N.M. 574930), was found on seaweeds near the Hawaii Marine Laboratory at Waiiki, November 24, 1923, by Marie C. Neal, for whom the species is named.

This *Elysia* bears some resemblance to *E. degeneri*, but can easily be distinguished from the latter by its long, smooth, tapering tentacles, whereas those of *degeneri* are short, knobbed, and nontapering. The coloration of

the parapodial lobes also show a marked distinction. The parapodial lobes of *degeneri* are

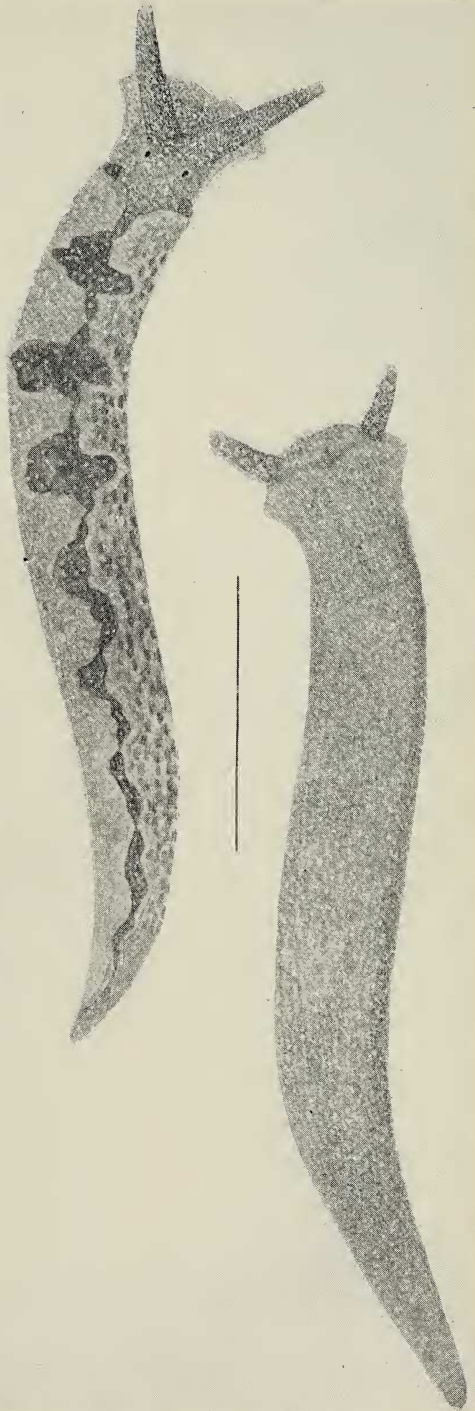


FIG. 11. *Elysia nealae* n. sp., dorsal and ventral aspects (X 4).

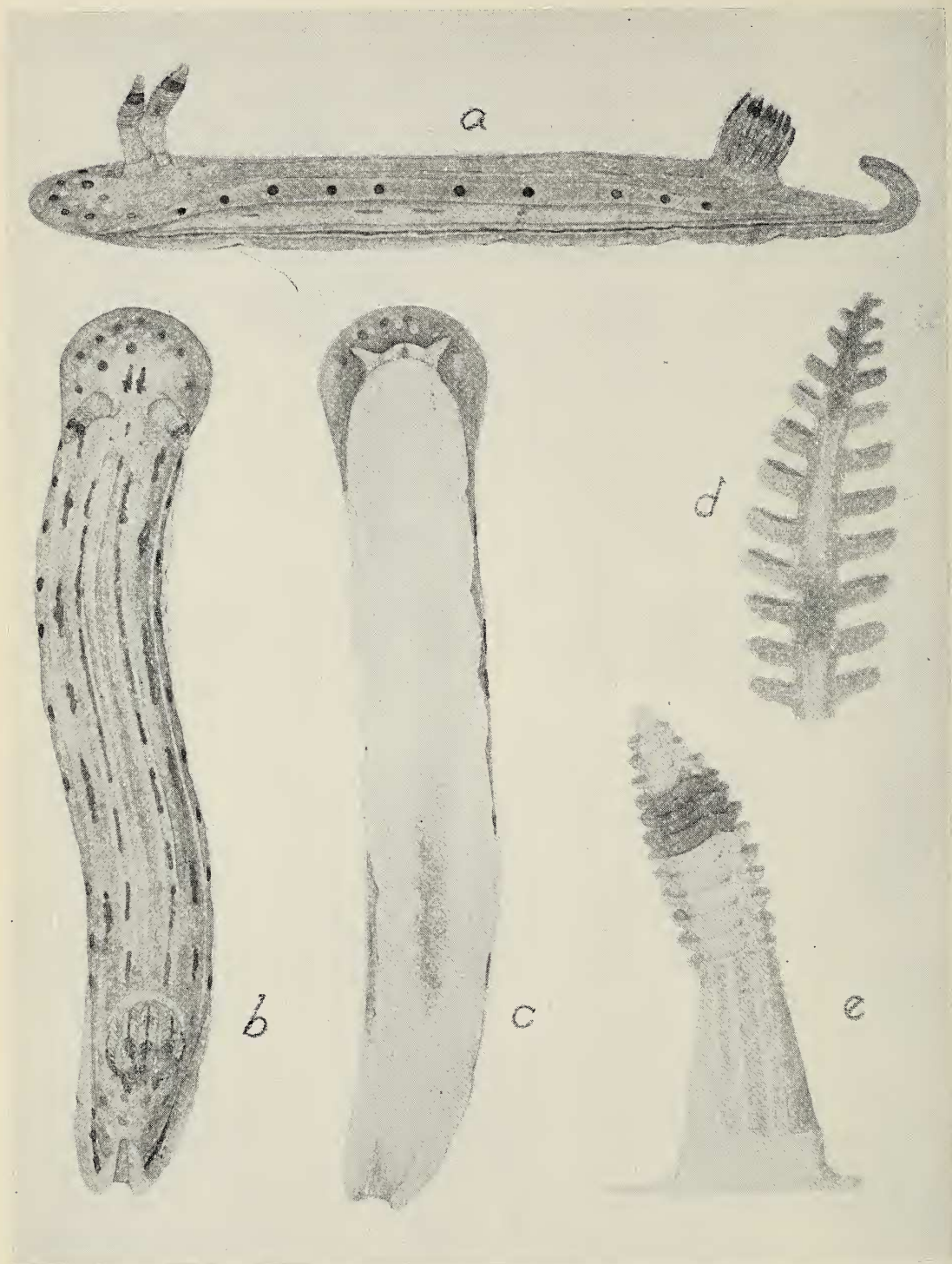


FIG. 12. *Glossodoris prismatica lineata* (Pease). *a*, Lateral aspect; *b*, dorsal aspect; *c*, ventral aspect; *d*, detail of branchia; *e*, rhinophore. (*a*, *b*, *c*, $\times 8$; *d*, *e*, greatly enlarged.)

bordered medially with a bright orange, whereas those of *nealae* are uniformly green.

Glossodoris (=Chromodoris) prismatica lineata (Pease)

Fig. 12

Doris prismatica var. *lineata* Pease, Zool. Soc. London, Proc. 1860: 32.

Body elongate, slender, of equal width from head to branchiae, tapering posteriorly and continuing anteriorly with a broad and rounded head shield. The rhinophores, which are retractile into sheaths with short white collars, are elongate, directed anteriorly and laterally and laminated about half their length with 12 laminae. The branchiae, retractile and surrounded by a low white collar, encircle the vent. They are 9 in number, small, lanceolate, and provided with 10 or 11 thick, spoon-shaped pinnae tapering in size at distal end of the gill. Foot elongate, conforming in width with body, rounded anteriorly, tapering to a point posteriorly, where it may be flexed dorsally beyond the cloak. Eyes minute, located posteromedial of the rhinophores. Oral tentacles short and blunt, directed anterolaterad of mouth. Color light grayish purple with body marked with longitudinal interrupted lines of deep blue; head shield marked dorsally and ventrally with round white and purple spots of equal size and in arrangement conforming to margin of head shield. Row of round purplish spots lining under margin of cloak. Blue line marking dorsal surface of foot near border. Rhinophores light grayish white, encircled with orange band near tip. Branchiae similarly colored, but with orange blotch at tip and near base. Length of animal 17 millimeters.

The specimen on which the above description is based and from which the figures are made was found in March, 1923, near the

Hawaii Marine Laboratory at Waikiki, where it was found on a rock in shallow water. Shortly after, two more specimens were brought in from Waianae. Although these agreed closely with the above in size and in nearly all external features, they differed essentially in having 11 gills instead of 9. In the type, described by Pease, 10 gills were present. A similar fluctuation in the number of gills has been reported previously in this family of nudibranchs, hence constancy in number of gills can not be used as a specific character. A variation among individuals within a species is reported by Alder and Hancock (1855) in which the gills of *Doris pilosa* are recorded as varying from 9 to 11 in number. Similar fluctuations in the number of gills within a species has also been observed by Frank M. MacFarland.

Pease's description is here given for comparison:

Elongate, soft, smooth, convexly rounded above, rather wider posteriorly, portion anterior to the dorsal tentacles somewhat dilated laterally and rounded in front. Branchiae small, erect, lanceolate, pinnate, ten in number, encircling the vent and retractile into a common cavity. Dorsal tentacles elongate, straight, directed forward and laterally, lamellated about two-thirds of their length, and retractile into simple cavities. Foot elongated and projecting much beyond the posterior edge of the body in a point, rounded in front. Colour light greyish-purple, along the back and the remainder of body white, irregular, longitudinal, opaque fine lines on the dorsal region, some of which are confluent. Margins of foot and body beautifully edged with violet. Branchiae whitish and longitudinally striped with orange. Tentacles white, with an orange zone near tip, and a second near the base.

Length 1 inch.

This description fits well in anatomical proportions and in coloring with the specimens at hand, except for lacking the interrupted purple lines and the numerous round purple and brownish dots which are present in my specimens.

A brief description with a figure of the spawn is given in Ostergaard (1950: 109). It is there referred to as *Glossodoris* sp.

Doridopsis macfarlandi sp. nov.

Fig. 13

Body elongate with parallel margins, rounded anteriorly and posteriorly. Cloak soft and devoid of spicules and with margins intensely folded. Rhinophores dark gray with white tips, rather stout, with about 15 lamellae on their distal half; arising from sheaths with slightly elevated simple margins and usually directed slightly anterolaterad. Oral shield light chocolate brown, square with rounded angles, and about half as wide as foot. Branchiae 12 in number, encircling anal papilla and separately retractile within cloak, each with a central stem from which branch and rebranch numerous lateral processes, dark gray. Foot rather narrow, rounded posteriorly, tapering anteriorly, where it is deeply notched and exposes the mouth, dark purplish brown posteriorly and light brown anteriorly with a narrow pale-blue margin, which is bounded anteriorly on its median side by a narrow dark-blue line. Dorsal surface light chocolate brown. Dorsal surface of cloak bluish black with numerous small, round, white spots decreasing in size medially.

Holotype (U.S.N.M. 574931) taken near the Blowhole below Koko Head Crater, Oahu, November 18, 1950, by Donald Strasburg.

Length 3 centimeters, width 12 millimeters.

The figure accompanying this description is of a paratype specimen which was found near the Hawaii Marine Laboratory at Waikiki in October, 1922, and which deposited an egg filament in the laboratory.

At intervals this species has been found at the above sites, also at Kawailoa, Oahu. The various specimens agree very closely; but there appear also to be several closely related species, which need to be worked out anatomically in order to separate them.

I have named this species for Dr. Frank M. MacFarland of Stanford University.

The structures of egg filament and veliger larva are figured and described in Ostergaard (1950: 108-109) under *Cryptodoris* sp.

Hexabranthus tinkeri sp. nov.

Fig. 14, Pl. 2

Body depressed, oval in outline when cloak is fully extended. A median area corresponding to the body region proper is variegated with bluish white, yellowish and reddish brown. Surrounding this area is a region of an equal width, softly colored with pale blue and carmine spots and reticulations. Beyond this area is one of similar width—a little narrower posteriorly and interrupted anteriorly—of a pale carmine with radial muscle bands appearing as fine dark-red striae. The cloak is bordered by two narrow bands—an inner dark red and an outer pale carmine—both interrupted anteriorly. Rhinophores elongate, orange, tilted posteriorly. They contain about 40 laminae and are supported by stout carmine stalks, retractile into sockets with low white collars. Branchial plumes, seven in number—three anterior, two lateral, and two posterior—are imperfectly tripinnate and retractile, but not into orifices. They are pink with red ribs. A carmine ring encircles each gill. A conical white anal papilla is situated posterior to the center of the branchial circle. Head small with a pair of deep orange oral tentacles extending from it, with their borders thrown into 8 or 10 intense folds and their greater diameter in lateral directions. The portion of the cloak anterior to the rhinophores is variegated with white, or pale blue, and carmine; dorsal side of foot has similar color which merges into golden at the margin. Foot oblong, rounded at both ends, extended a little beyond cloak when animal is creeping. It is pale flesh with golden margins, which are approximated and crumpled when the animal is swimming. When the animal is at rest, the broad cloak margins are rolled up against the body. Swimming is effected by vigorous transverse flecions of the body and undulating movements of the broad, thin cloak, which serves as fins.

The holotype (U.S.N.M. 574926) was found at Waikiki, May 19, 1922, by Robert

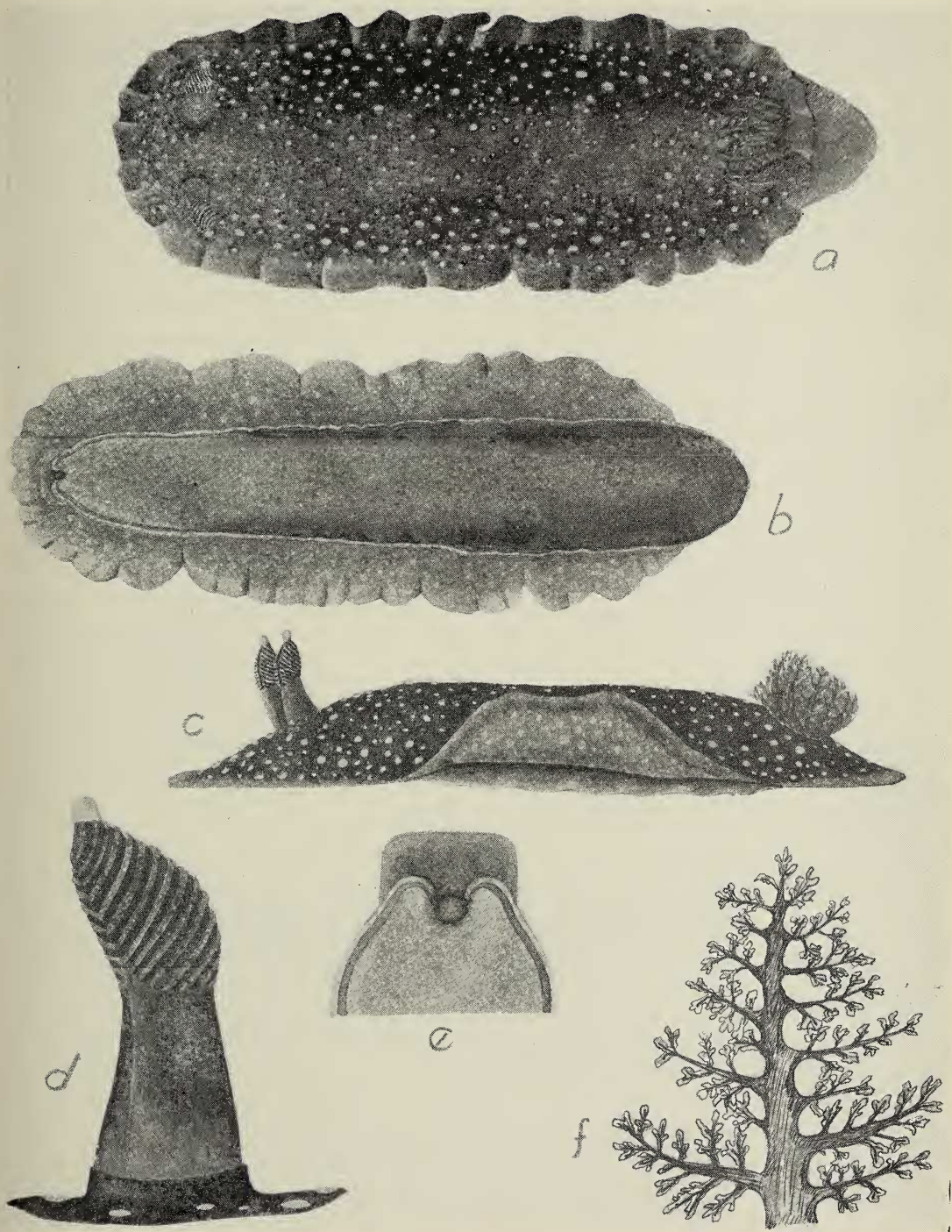


FIG. 13. *Doridopsis macfarlandi* n. sp. *a, b, c*, Dorsal, ventral, and lateral aspects; *d*, rhinophore; *e*, oral hood and anterior portion of foot; *f*, branchia. (*a, b, c*, $\times 3.7$; *d, e, f*, variously enlarged.)

Hope. It measures 13 by 10 centimeters (dimensions of cloak when fully extended). Paratypes bearing the following data are at hand: Nanakuli, Oahu, August, 1950, Charles Cutress; Pearl Harbor, Oahu, October 29, 1949 (2 specimens), June 26, 1950 (1 specimen), July, 1950 (3 specimens, C. Cutress), September 30, 1950 (1 specimen with margin of cloak dark red); on open shore of Oahu, November, 1949; Kailua, Oahu, March 19, 1950; Kahala, Oahu, April 17, 1950.

The largest specimen I have seen (the paratype from Kailua) was 23 centimeters long.

I have named this conspicuous species for Mr. Spencer Tinker, Director of the Honolulu Aquarium, in appreciation of his very generous aid in securing specimens of nudibranchs for me.

The numerous specimens of *H. tinkeri* observed from time to time, and obtained from various parts of Oahu, have shown little variation. However, three specimens obtained from Pearl Harbor during 1950 had a marginal zone of the cloak, 3 centimeters wide, of a deep carmine, darkest near the margin. This zone corresponds to the three outer zones of the type (figured) and, in general, to all other specimens observed. This is probably only a color variation. The gills vary from six to eight in number. When there are six, which appears to be the usual number, they are arranged in a circle around the anal papilla, with three on each side. When seven gills are present, as in the type, one is placed in the median line between the anterior pair of the usual six. But when the animal has eight gills, the posterior gill on each side is represented by two smaller and closely approximated gills. An anomalous deviation from these typical arrangements has also been observed.

Hexabranchnus tinkeri is readily distinguished from *H. aureomarginatus*, another Hawaiian species, thus:

Gills large and much branched, 6 or 7 in number; rhinophore sheaths with low, white collars; oral tentacles coarsely scal-

loped. Color of animal yellowish or white, variegated with carmine or rose; margins of cloak carmine or pink.
 *Hexabranchnus tinkeri*

Gills rather small and less branched, 4 to 6 in number; rhinophore sheaths with high collars variegated with white and reddish orange. Oral tentacles intensely scalloped. Color of animal bright orange red variegated with white; margins of cloak white with golden border.
 *Hexabranchnus aureomarginatus*

It may also be compared with *Hexabranchnus sandwichensis* (Souleyet and Eydoux), from which it differs in coloration and in mode of branching of the gills. Souleyet's specimen was obtained from the Island of Hawaii, and it appears to be rare, since none answering to its description has come under my observation during a period of about 30 years of research in this group.

The description of *H. sandwichensis* is quoted from Souleyet and Eydoux (1852: 451, pl. 25, figs. 1-4).

Doris sandwichensis, nobis.

Cette grande et belle espèce a le corps ovalaire, aplati, more, lisse; le dos d'un blanc bleuâtre sur les côtés, et de couleur violacée sur la ligne médiane, est marqué dans toute son étendue de taches pourprées de différentes grandeurs et irrégulièrement disposées; les bords du manteau très-larges, minces et ondulés, sont d'une belle couleur pourpre, interrompue en dessous par une bande blanchâtre qui entoure le pied et qui se prolonge, en avant, au delà de la bouche et de ses appendices. Les tentacules supérieurs, en forme de massue et lamelleux à leur sommet, sont également d'une couleur pourpre très-foncée. Les appendices buccaux sont large, à bords onduleux et comme frangés. Le pied, de couleur jaunâtre, a à peine la moitié de la largeur du corps; ses bords sont minces et ondulés comme ceux du manteau. Les branchies forment huit arbuscules disposés en cercle autour de l'anus; cette ouverture est placée au centre d'un tubercule arrondi et saillant.

Cette *Doris* habit les îles Sandwich; nous l'avons recueillie à Hawaïi, la principale des îles de ce groupe. Sa longueur est de douze à quatorze centimètres.

Doris cardinalis Gould (1852: 302, pl. 25, figs. 397a-b) differs from *H. tinkeri* and *H. aureomarginatus* particularly in the oral tenta-

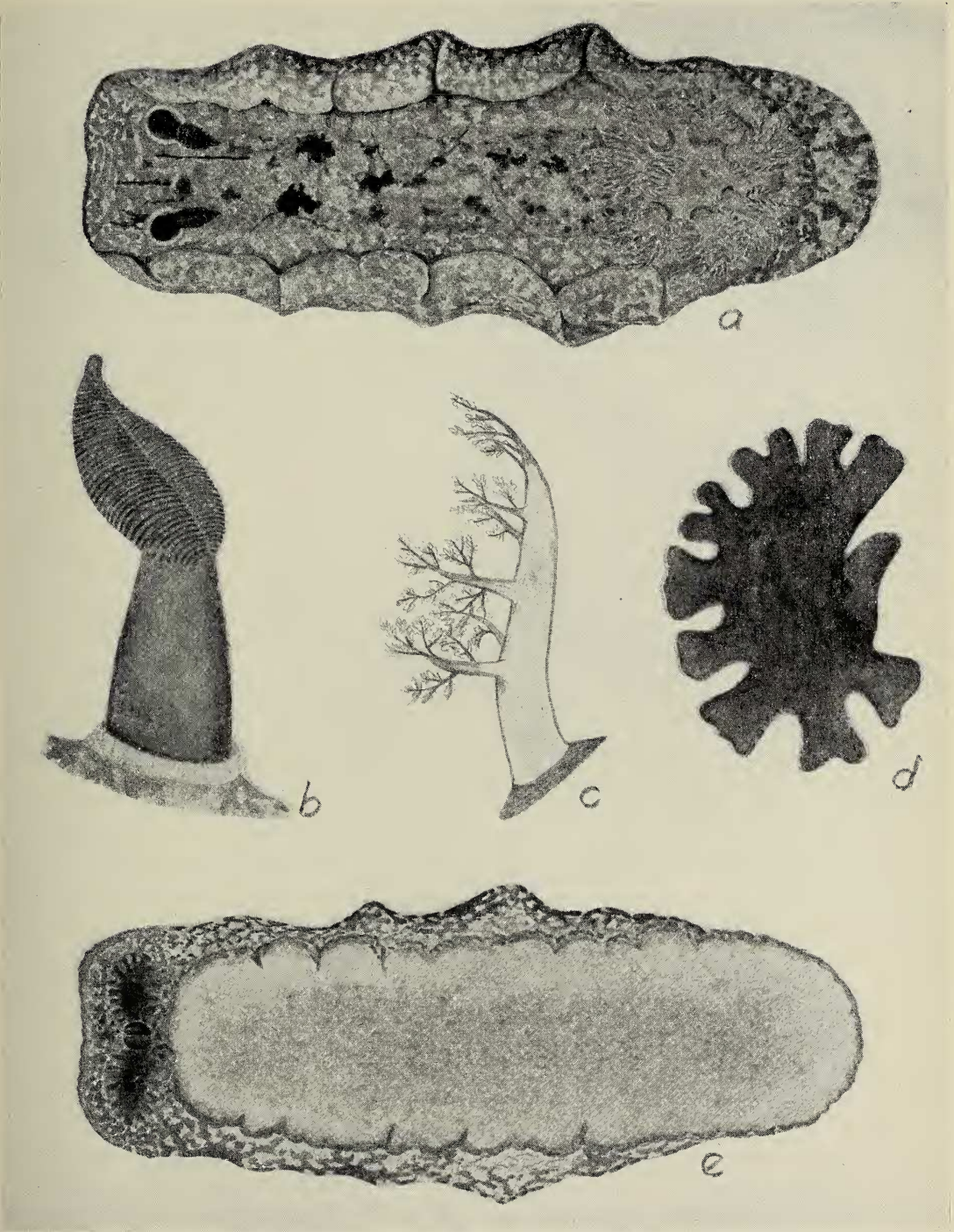


FIG. 14. *Hexabranhus tinkeri* n. sp. a, Dorsal aspect; b, rhinophore; c, branchial plume; d, oral tentacle; e, ventral aspect. (a, e, natural size; b, c, d, enlarged.)

cles, which in *Doris cardinalis* are bilobed, but in the two species here described are multilobular.

Hexabranchus aureomarginatus sp. nov.

Fig. 15, Pl. 2

Body much depressed, oval in outline when cloak is fully extended. Cloak wide and very thin at edges, serving as swimming lobes. A median dorsal area, corresponding to the body region, is bright red with groups of fine white flecks, some of which are concentrated to form large spots of irregular outline. Lateral to this area is one of pale rose, interrupted anteriorly, but continued posteriorly by a narrow connection with a corresponding area of the opposite side. Marginal region consisting of three rather narrow uninterrupted color zones: innermost bright red; middle white with radially disposed muscle bands; outermost golden yellow. Rhinophores long and stout, with about 40 golden laminae and with basal stems of reddish orange with a white blotch posteriorly at base of laminated portion; issuing from elevated collars which are variegated with bright red and white and bordered with a narrow golden band. Branchial plumes six, golden with violet stems, retractile, and arranged in a circle around the low anal papilla, the two posterior pairs being closely united at their bases. Head small, usually concealed; from it a pair of oval, golden, leaf-like tentacles with intensely folded borders extend laterally, their long axes directed laterally. Foot oblong and narrowed toward its truncate ends, extending beyond cloak posteriorly when animal is creeping, color beneath, yellow with golden border. A long dark blotch may appear at its center with the viscera showing through. Dorsally the foot is greenish yellow with lighter borders and with a white blotch on its median part near the posterior extremity. The ventral side of the body bordering on the foot is pinkish white; laterally the colors correspond to those of the dorsal surface.

Length of holotype, when fully extended, 76 millimeters, width 65 millimeters.

Though smaller than many other specimens seen, this specimen was chosen for the holotype as its coloration is typical of the species. It was found off the Hawaii Marine Laboratory at Waikiki, within wading distance of the shore, February 2, 1922, by Robert Hope (U.S.N.M. 574927).

Paratypes: 1 specimen, Mokuleia, Oahu, May 22, 1950; 1 specimen, found in reef pool 1 foot deep, Hauula, Oahu, July 1, 1950, Mrs. Pauline Piltz; 2 specimens, near Elks Club, Waikiki, Oahu, April, 1923.

In the many specimens that have come under my observation over a period of nearly 30 years, I have found a close agreement in essential characters, such as would constitute a good species. While some variation in the intensity of coloring does occur, the only radical departure has been noted on the dorsal surface of the foot. This may vary from a grayish yellow with white markings, to a deep carmine. In all specimens observed, the golden margin of the cloak has been present, which seems a good descriptive character on which to base the name of the species.

Most specimens have been found at Waikiki, where they may be seen swimming, or at rest on coral. Swimming is effected, as in *H. tinkeri*, by vigorous flexings of the body and undulations of the cloak margins. When the animal is at rest, the margins of the cloak are rolled up against its sides.

A fluctuation in the size of the gills is found in some specimens, the middle pair being smaller than the others. The largest animal seen was found at Lanikai, Oahu, February 12. It measured 17 by 15 centimeters.

The reproductive orifices, as in *H. tinkeri*, are located on the right side of the body, about one fourth the length from the anterior end, near the junction of the foot. The conspicuous eversible penis is partly embraced on its posteromedial side by the semicircular female orifice. Copulation takes place as follows: two individuals unite with heads turned